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FLOCKED SUBSTRATES FOR USE AS SCOURING MATERIALS

The present invention relates to substrates that are suitable for consumer use as scouring materials for cleaning surfaces in various environments, including domestic, industrial,
5 hospital and food industry environments.

Substrates that provide a scouring action are widely used for cleaning in the domestic environment, being most frequently employed for cleaning cooking utensils and for cleaning surfaces in kitchens and bathrooms. Scouring substrates that are already known
10 for such uses include resin-bonded non-woven webs of the type described in US-A-2 958 593. Those webs may incorporate abrasive particles to enhance their abrasive action.

Also known for scouring cooking utensils are pads that are formed from a continuous tow of crimped or undulated filaments, as described in US-A-4 991 362. Those pads may also
15 incorporate abrasive particles to enhance their abrasive action.

It has also been proposed, in GB-A-1 539 477 and WO 02/06009, to use flocked substrates for domestic cleaning and to enhance the abrasive action of the substrates by depositing abrasive particles (in the form of beads of resin) on the free ends of the flock fibres.
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With the increasing use, in many environments, of surfaces that can be damaged by aggressive abrasive materials, there is a growing demand from consumers for cleaning substrates that have a softer abrasive action but which, nevertheless, are able to remove material such as dirt, grease, burnt-on food etc. quickly and thoroughly. Consumers also
25 require cleaning substrates that are themselves easy to clean (for example, simply by rinsing after use) and retain no undesirable odours and no undesirable residues (e.g. pieces of food) that could subsequently contaminate other surfaces on which they might be used. It is an object of the present invention to enable those requirements to be met.

30 The present invention is based on the surprising discovery that flocked substrates in which the flock fibres are short in comparison with those previously-proposed for use in domestic scouring substrates can function efficiently as scouring materials without the

need to deposit any abrasive particles on the flock fibres. The absence of abrasive particles on the flock fibres reduces the likelihood that the substrate will damage a surface that is being cleaned.

- 5 The present invention accordingly provides, for use as a domestic scouring material, a flocked substrate wherein the flock comprises fibres that are arranged substantially perpendicular to the substrate and have a maximum length of 2.0 mm, the fibres being substantially free of abrasive particles.
- 10 Flocked substrates in which the flock fibres have a length of less than 2.0 mm and are free of abrasive particles have already been proposed for use as polishing pads in certain industrial processes (see WO 98/45112, FR-A-2 799 403 and EP-A-1 057 590 which describe the use of flocked substrates for polishing items such as optical glass and semiconductor substrates). In those industrial processes, the polishing pads are typically
- 15 used in combination with some form of polishing compound.

The present invention also provides a cleaning article comprising a flocked substrate laminated to a layer of foam, wherein the flock comprises fibres that are arranged substantially perpendicular to the surface of the substrate to which they are secured and

20 have a maximum length of 2.0 mm, the fibres being substantially free of abrasive particles. The foam can be of any type known to be suitable for domestic cleaning, including cellulosic foams having a density in the range of from 75 to 125 Kg/m³ and polyurethane foams having a density in the range of from 18 to 30 Kg/m³. A cleaning article of that type, which may be in the form of a pad suitable for hand-held use, offers the user two

25 different cleaning actions that are useful when cleaning surfaces, namely a scouring action provided by the flocked surface of the pad and a wiping action provided by the opposed foam surface of the pad.

The present invention further provides cleaning article comprising a flocked wipe, wherein

30 the flock comprises fibres that are arranged substantially perpendicular to the surface of the wipe to which they are secured and have a maximum length of 2.0 mm, the fibres being substantially free of abrasive particles.

The term "wipe" as used herein means liquid-absorbent web material that is suitable for use in either a dry or a damp condition to remove an unwanted substance from a surface by means of a wiping action. Wipes are often classified, in accordance with their durability, as "disposable" (meaning that they are intended to be discarded immediately after use), "semi-disposable" (meaning that it is possible to wash and re-use them a limited number of times), and "reusable" (meaning that they are intended to be washed and re-used). Known wipe materials generally have a basis weight in the range of from 15 to 300 gm/m², although materials having a higher basis weight can be used, and comprise knitted, woven and non-woven materials. Wipe materials are often hydrophilic but can also be specifically constructed to absorb non-aqueous liquids, for example grease and oil.

In a cleaning article in accordance with the invention, the flock should be applied in such a way that at least one area of a liquid absorbent surface of the wipe remains exposed. A cleaning article of that type also offers the user two different cleaning actions that are useful when cleaning surfaces, namely a scouring action provided by the flocked area(s) of the wipe and a wiping action provided by the exposed liquid absorbent area(s).

Typically, both sides of a wipe provide the same wiping action. If, however, a cleaning article in accordance with the invention comprises a wipe in which the wiping action is provided by one side of the wipe only then the flock fibres should be applied so that part at least of the surface on that one side remains exposed.

By way of example, embodiments of the invention will now be described with reference to the accompanying drawings, in which:

Fig. 1 is a diagrammatic cross-section of a scouring substrate;

Fig. 2 is a plan view of a patterned scouring substrate;

Fig. 3 is a diagrammatic cross-section of a hand-held cleaning pad;

Fig. 4 is a perspective view of a hand-held cleaning pad;

Fig. 5 is a diagrammatic cross-section of another cleaning article; and

Figs. 6 and 7 are plan views of other cleaning articles.

The scouring substrate 1 shown in Fig. 1 is a flocked substrate in which the flock comprises fibres 3 arranged substantially perpendicular to the substrate material 5, and secured to the substrate material by a layer of adhesive 7.

5 Flocked substrates of the general type shown in Fig. 1, and processes for manufacturing them, are well known. In the conventional processes, a layer of adhesive is applied to the substrate material and, while the adhesive is still tacky, flock fibres are attracted to it electrostatically so that they become embedded at one end in the adhesive and stand up generally perpendicular to the substrate material. The substrate is then heated in an oven to
10 dry and cure the adhesive layer.

For the manufacture of the scouring substrate 1, any woven or non-woven flexible material suitable for domestic cleaning (i.e. able to withstand hot water and cleaning fluids) can be used for the substrate material 5. One suitable material is a woven
15 polyester/cotton material comprising 65% polyester and 35% cotton, and having a basis weight of 105 g/m².

Any fibres known to be suitable for flocking and also suitable for domestic cleaning (i.e. able to withstand hot water and cleaning fluids) can be used for the flock 3. A particularly
20 suitable material is polyamide, especially in the form of nylon 6 or nylon 6.6, but polypropylene or polyester fibres could also be used. The fibres, which may be coloured as required, preferably have a titre (mass per unit length) in the range of from 15 to 80 dtex (more preferably in the range of from 22 to 50 dtex) and are cut to a length no greater than 2.0 mm. It has been found that a particularly effective scouring action is achieved
25 using fibres having a length of 0.8 mm and a titre of 44 dtex, or a length of 0.4 mm and a titre of 22 dtex.

The flock 3 may be applied evenly over the substrate material, in which case it is preferably applied in an amount of from 150 to 180 g/m². Alternatively, the flock 3 may
30 be applied so that it forms a pattern over the surface of the substrate material 5: a process by which that can be achieved is well-known and involves applying the adhesive 7 to the surface in the required pattern, usually by some form of printing process, with the result

that the flock fibres will be adhered to the substrate only in the areas to which the adhesive has been applied. Fig. 2, for example, shows a pattern that is achieved by omitting the adhesive 7 from regularly-spaced rectangular patches 11 of the substrate material 5. In this case, the flock fibres 3 will adhere to the substrate material 5 everywhere except in those patches, where the substrate will remain exposed. The size of the patches 11 can be altered to change the area of the substrate material 5 that is not covered by the flock 3, and the shape of the patches 11 can also be changed.

The adhesive selected to bind the flock 3 to the substrate material 5 should also be suitable for domestic cleaning (in particular, it should be able to withstand hot water and cleaning fluids), and should not adversely affect the flexibility of the substrate material. Suitable adhesives are acrylic adhesives and PVC (polyvinylchloride) resins, and are applied in an amount (for example, about 90 to 140 g/m²) that will yield a very thin layer on the substrate material.

It has been found that a flocked substrate constructed as described above with reference to Fig. 1 will provide an effective scouring action in the domestic environment, sufficient not only to clean kitchen and bathroom surfaces but also to remove burnt-on food from cooking utensils using normal liquid detergents, despite the absence of any abrasive particles on the flock fibres 3. The scouring action has been found to be comparable to, and in some cases better than, that of non-woven, non-scratch, domestic scouring materials that are currently commercially available including some that contain plastic (or other soft) abrasive particles. On the other hand, the absence of abrasive particles from the flocked substrate substantially eliminates the risk of any damage being done to the surface that is being cleaned. The flocked substrate has been found not to trap residues of material removed from the surface that is being cleaned, so that any residues remaining on the substrate after use are easily removed by simply rinsing the substrate in water. If desired, the substrate can be washed in hot water and detergent, and then re-used.

The appearance of the flocked substrate can be varied by using a substrate material that is coloured, or carries a printed design, and applying the flock 3 in such a way that the colour or printed design remains apparent.

In a preferred embodiment of the invention, a flocked substrate 1 as described above with reference to Figs. 1 and 2 is laminated to a layer of foam 9 as shown in Fig. 3. The laminate may then be cut into pads of a suitable size for domestic cleaning, in particular for hand-held use. The foam 9 can be of any type known to be suitable for domestic cleaning, including cellulosic foams having a density in the range of from 75 to 125 Kg/m³ and polyurethane foams having a density in the range of from 18 to 30 Kg/m³.

The foam can be of any suitable thickness but it has been found that thicknesses in the range of from 0.5 to 5.0 cm are particularly useful for domestic cleaning. When a thinner layer of foam is used, the laminate can be cut into pads having a larger surface area (e.g. having dimensions of up to 20 cm by 20 cm). A thicker layer of foam may be more suitable for pads having a smaller surface area (e.g. dimensions of about 7 cm by 9 cm).

By way of example, a cleaning pad 13 that comprises a flocked substrate 15 laminated to a layer of foam 17 is shown in Fig. 4. In this case, the flock is applied on the substrate to form the pattern illustrated in Fig. 2: that is not essential, however, and the flock could be applied to form other patterns, or be applied continuously over the substrate.

Fig. 5 shows a cleaning article 21 that also comprises a flocked substrate in which the flock comprises fibres 23 arranged substantially perpendicular to the substrate 25, and secured to the substrate by a layer of adhesive 27. In this case, however, the substrate 25 comprises a wipe suitable for consumer use for cleaning surfaces. The wipe 25 may be "disposable" (meaning that it is intended to be discarded immediately after use), "semi-disposable" (meaning that it is possible to wash and re-use it a limited number of times), or "reusable" (meaning that it is intended to be washed and re-used). Known wipe materials generally have a basis weight in the range of from 15 to 300 gm/m², although materials having a higher basis weight could be used. Woven and knitted materials are suitable, as are non-woven materials including dry-laid, wet-laid and spun-bonded materials which may, as appropriate, be thermally-bonded, resin-bonded, ultrasonically-bonded, needle-punched, hydro-entangled etc.

Materials suitable for disposable wipes include spun-bond and spun-lace non-woven materials having a basis weight in the range of from 15 to 75 g/m² and formed, for example, from PET, rayon, viscose, wood pulp, polypropylene, natural fibres, polyamide or mixtures thereof. Examples of disposable wipe materials are available under the trade names: "Sontara" from DuPont; and "TenoLace" from Tenotex of Terno d'Isola, Italy.

Materials suitable for semi-disposable wipes include spun-lace non-woven materials having a basis weight in the range of from 75 to 250 g/m² and formed, for example, from fibres or microfibres of polyester, polyamide, viscose. Examples of semi-disposable wipe materials are available under the trade names "Scotch-Brite™ Dusting Cloth" from 3M Company of St. Paul, Minnesota, USA; and "Sontara" from DuPont.

Materials suitable for reusable wipes include knitted, woven, thermo-bonded, latex-coated, and chamois-type materials having a basis weight in the range of from 100 to 300 g/m² and formed, for example, from fibres or microfibres of PET, rayon, viscose, polypropylene, natural fibres, polyamide or mixtures thereof. An example of a reusable wipe is available under the trade name "Ideal" from Lever of Madrid, Spain.

Wipes are often hydrophilic but can also be specifically constructed to absorb non-aqueous liquids. Microfibre wipes, for example, are intended to remove grease from surfaces.

Typically, both sides of the wipe will provide the same wiping action. If, however, only one side of the wipe provides a wiping action then the flock fibres are applied to the wipe in such a way that a sufficient area of that one side of the wipe remains exposed and can be used to provide a wiping action. For example, in such a case the flock fibres could be applied only to the other (non-wiping) side of the wipe.

The description above of the flock of Figs. 1 to 3 applies also to the flock of cleaning article 21. The flock can likewise be applied either evenly over the surface of the wipe, in which case it is preferably applied in an amount of from 150 to 180 g/m², or more preferably so that it forms a pattern over the surface of the wipe in the manner

described above. In the latter case, use of a screen coating process for applying the adhesive 27 in a desired pattern on the surface of the wipe material is preferred, because it enables a very thin layer of a high-viscosity adhesive to be applied: that, in turn, enables the liquid-absorbent properties of the non-coated regions of the surface and the liquid-absorbent properties of the other surface of the wipe (as appropriate) to be retained.

The flock 23 may be applied to the surface of the wipe 25 in the pattern illustrated in Fig. 2 or, by way of example, in the alternative patterns illustrated in Figs. 6 and 7. Other patterns could be used, including non-ordered patterns if desired.

Fig. 6 shows a pattern that is achieved by printing adhesive 27 onto the wipe 25 as two perpendicular sets of parallel lines; and Fig. 7 shows a pattern that is achieved by printing adhesive 27 onto the wipe 25 as one set of parallel lines. When the surface of the wipe 25 to which the flock is applied is liquid-absorbent, the flock is preferably applied in such a way that the liquid-absorbent properties are retained in the un-flocked areas. The flock is also preferably applied in such a way that any liquid-absorbent properties of the other surface of the wipe are unaffected. For some applications, it may be desirable to apply the flock only in one selected area of the wipe 25, for example, in one corner.

The adhesive selected to bind the flock 23 to the wipe 25 should also be suitable for use in the conditions for which the wipe is intended (for example, able to withstand hot water and cleaning fluids). Preferably, it should not adversely affect either the flexibility of the wipe or, as already mentioned, the liquid-absorbency of the uncoated parts of the wipe surface. Suitable adhesives and coating weights are as described above for the adhesive 7 of Fig. 1.

If desired, a further coating of adhesive can be applied on top of the first layer, after the flock has been applied and the first layer of adhesive has cured. This additional process step is already known in the textile art for increasing the durability of flocked materials.

It has been found that a flocked wipe constructed as described above with reference to Fig. 5 will, through use of the flocked surface, provide an effective scouring action sufficient

not only to clean work surfaces but also to remove burnt-on food from cooking utensils using normal liquid detergents, despite the absence of any abrasive particles on the flock fibres 23. The scouring action has been found to be comparable to, and in some cases better than, that of non-woven, non-scratch, domestic scouring materials that are currently commercially available including some that contain plastic (or other soft) abrasive particles. On the other hand, the absence of abrasive particles from the flock fibres 23 substantially eliminates the risk of any damage being done to the surface that is being cleaned. At the same time, the unflocked surface or surface areas of the wipe are available to provide the normal wiping action for which the wipe 25 is intended. The flocked surface or surface areas of the wipe 25 have been found not to trap residues of material removed from a surface that is being cleaned, so that any residues remaining on the wipe after use are easily removed by simply rinsing the wipe in water.

The wipe 25 will typically be of a size suitable for hand use but could, for example, be of a larger size suitable for use on a mop head for cleaning floors.